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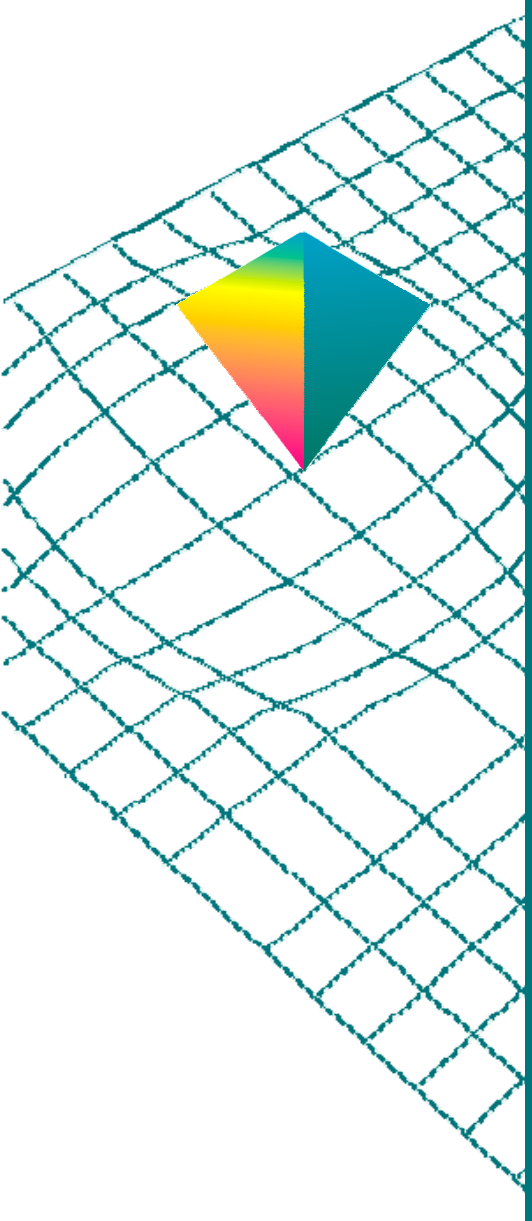

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Building of Electromechanical Robot Systems with Non-Holonomic Constraints

ABSTRACT

Spatial electromechanical multicoordinate robotic systems with non-holonomic constraints are discussed. A building principle of electromechanical robot systems are proposed. The electromechanical robot system examples are presented.

1. INTRODUCTION

Spatial electromechanical multicoordinate robotic systems with non-holonomic constraints are intended for realization of complex movements on several coordinates simultaneously without mechanical elements of transformation of a movement at the expense of ample opportunities of linear stepping motors (LSM) with air support. Such LSM allow developing the concept of the multicoordinate electric drive. The concept consists in constructive modular association of several coordinates in one or several executive coordinate devices controlled by the computer.
The technical basis of construction of a complex movement is served in the beginning of seventieth years offered electromagnetic coordinate modules and methods of electrical splitting of a step. They are allowing (universal and technically simply) to transform the digital information to the required laws of change of currents of system, forming management by a movement.

2. THE BUILDING PRINCIPLE OF ELECTROMECHANICAL ROBOT SYSTEMS

For complex movements with several degrees of freedom a stated principle of construction of coordinate systems has allowed to develop the concept of the multicoordinate electric drive. The basic idea of which consists in overlapping, that is constructive association of mobile parts of several coordinates in one executive multicoordinate system. The integration of elements of a design assumes division of channels of management by a complex movement and modular fulfillment of active elements of a design of the electromechanical coordinate device. Thus it is possible to replace mechanical constrains electromagnetic, which are supervised by means of electronic management, carried out with computer. Escalating functional opportunities and capacities of a drive comes true at the expense of number and arrangement of typical

electromechanical modules, unification of management simultaneously in all coordinates of a complex movement.

Element bases of such multicoordinate electric drive are:

– electromechanical modules, ensuring rotary and linear movements, and also complex movement in Cartesian, cylindrical and spherical systems of coordinates, carried out without kinematic transformations;

– electronic modules, any required trajectories realizing at microprocessor management with deep reduction and scaling of a movement.

The base designs of coordinate modules linear, rotary and planar types are primary elements of coordinate system. They pair combinations to a common driven element will be formed with more complex modules with a direct combined movement.

3. THE ELECTROMECHANICAL ROBOT SYSTEM EXAMPLES

On the basis of elementary modules, realizing one-coordinate and two-coordinate moving electromechanical systems and the device for robotization of the process equipment and flexible industrial systems can be created which allow rather simply to carry out any motion in 3D space. A robotic complex for the forming of wire interconnections and connections of wire conclusions is shown in paper and is intended for automation of one of the basic and the most complex operations of technological process of assembly of the integrated circuits in microelectronics. With the purpose of increase of accuracy and speed of such equipment, in it multicoordinate systems, constructed on the basis of an one-coordinate and a two-coordinate a LSM, are used. In aggregate they provide fulfillment as of the basic technological action – forming of wire jumpers, and fulfillment of auxiliary.

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